

There aren't plenty more fish in the sea

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Associate Professor Joy Becker at the Sydney Fish Market. Though farmed fish is still a small (though growing) part of overall turnover, the top selling fish at the Sydney Fish Market, for 2019 by weight, was farmed Yellowtail Kingfish. Credit: Stefanie Zingsheim

The earliest known aquaculture sites were created more than 6000 years ago by Australian Aboriginals to grow eels. About five thousand years

later, the Chinese began farming carp. Today aquaculture is the fastest growing, food-related primary industry in the world. And we need it to be.

World production of farmed [fish](#) overtook the production of farmed beef more than ten years ago. Then in 2018, farmed seafood for human consumption exceeded wild-caught seafood for the first time.

These aren't just interesting and perhaps surprising pieces of trivia. They're markers of a profound change in how we humans are producing our protein-rich foods.

The motivators towards aquaculture are not unfamiliar. Farming [land animals](#) is resource intensive, hard on land and waterways and too often, hard on the animals themselves. At the same time, there are about 4.6 million fishing vessels plying the seas, including massive factory ships, which have turned parts of the ocean into fish ghost towns and threaten some species with extinction.

While aquaculture is by no means a penalty free alternative, as the world population grows from around 7.8 billion today to a projected 9 billion by 2030, it presents opportunities to produce more protein using less, not just through farming fish, but also molluscs and crustaceans. This plays very much to the goals of Associate Professor Joy Becker (CertEd '10).

"What gets me out of bed in the morning is food security," she says from her office at the University's Centre for Carbon, Water and Food in Camden, west of Sydney. "The fact is, we need to be able to farm fish so it's sustainable, safe for people to eat and affordable. Affordable is a big one."

Aquaculture in Australia

Growing up in a fully land-locked part of rural Canada, Becker was always around beef and poultry but somehow became fascinated by fish. So what brought her to Australia? "I was following the salmon," she says. "I did my Ph.D. in parasites and salmon have parasite problems. Suddenly, I was in Tasmania where the salmon farming industry was going gangbusters."

Tasmania isn't the only aquaculture state. "It's everywhere in Australia," says Becker with some excitement. "New South Wales has oysters, Murray cod, silver perch. In Victoria it's abalone and rainbow trout. WA and the Northern Territory do barramundi. Lots of prawns in Queensland. South Australia has southern Bluefin tuna and oysters as well. There's also barramundi and yellowtail kingfish hatcheries. There's lots more happening and nowhere is untouched."

Her aquaculture focus is fish diseases, giving Becker plenty to think about because it's a serious issue for the industry. Fish farming is intensive, tending to put lots of fish in relatively small spaces, either ponds, tanks or enclosed by nets in the ocean. There are knock-on effects.

With sea cage farms, the copious fish waste falls into a very localized part of the ocean wreaking havoc on water quality and the ecosystem. Tank and pond fish farms can use lots of energy maintaining liveable environments for their fish. Plus they need plenty of water that then becomes tainted with fish waste.

Intensive [fish farming](#) also makes disease outbreaks virtually inevitable and the effects can happen on a grand scale. In one six month period, a salmon farm in Tasmania lost more than a million fish to Pilchard orthomyxovirus, most likely caught from native pilchards. Of course, it works the other way too; a fish farm disease can easily spread to wild populations.

Addressing these problems comes under the remit of the University's Aquatic Animal Health team which has been operating now for 20 years. Through strong affiliations with a number of industry organizations, the team is responsive to issues as they arise and works to ensure new information quickly goes where it's needed.

A large part of what Becker does in the team, is looking at how to prevent disease outbreaks and how to treat them in ways that don't compromise the food value of the fish or fall foul of the rightly strict Food Safety Act. In fact, exported Australian seafood is highly regarded specifically because it's clean and safe, meaning minimal chemical or drug residues.

"In Australia drugs are only used if the fish are sick, not as a preventative," says Becker. "It's all licensed drugs and you have to have a veterinarian prescribe them."

It's all fish food

Another vital element for healthy farmed fish is feeding them the right food, complicated by the fact that some of the most desirable and profitable farmed fish—salmon, trout, tuna, barramundi—are carnivores. They eat other fish. So any thought that farming fish takes pressure off wild fish populations, doesn't fully play out.

However, farmed fish aren't fed whole fish. They're fed pellets containing fish meal made from anchovies and pilchards caught off the coast of South America. The fishmeal market is growing as vigorously as the aquaculture industry.

"The cost of the pellets is greatly impacted by the El Nino/La Nina weather cycles which affect wild fish numbers," says Becker. "We have years with lots of fishmeal and fish oil, with relatively low prices. We

have lean years when prices can double, impacting the farmers."

Minimizing the amount of fish meal in food pellets, while maintaining fish health, has been the subject of intense research for a number of years. Various vegetable-based options have been considered, but they lack something essential in feed for carnivorous fish; enough omega 3 fatty acids. The search continues.

Still, the core benefit of fish farming remains; it's efficiency in converting feed into usable protein. Where land animals carry themselves heavily across the earth, fish are in a buoyant environment, and therefore able to grow on substantially less food. Carp, shunned in Australia but a popular food source internationally, requires fifteen times less food to produce, kilo for kilo, than beef.

Another key benefit of aquaculture is it can be established in more places. Some Australian graziers are converting land to aquaculture, particularly for freshwater crustaceans like crayfish, while Indonesia, and many other South East Asian countries, are finding huge economic and employment benefits in sating China's ravenous hunger for seafood.

"The Indonesians produce high value fish species for export—grouper and barramundi," says Becker who is often in Indonesia working with local fish producers. "The income from those fish means people can buy food they want to eat in their local economy."

Soon we might have to rethink the idea of plenty more fish in the sea.

Provided by University of Sydney

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